



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONCORIDATION NO.
09/600,936	10/03/2000	Mitsuaki Nakamura	49917(868)	2694
21874	7590	04/21/2004	EXAMINER	
EDWARDS & ANGELL, LLP P.O. BOX 55874 BOSTON, MA 02205			EDWARDS, PATRICK L	
		ART UNIT	PAPER NUMBER	
		2621		
DATE MAILED: 04/21/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	NAKAMURA ET AL.
Examiner Patrick L Edwards	Art Unit 2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on _____.
2a) This action is **FINAL**. 2b) This action is non-final.
3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-6 and 8-13 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
5) Claim(s) ____ is/are allowed.
6) Claim(s) 1-6 and 8-13 is/are rejected.
7) Claim(s) ____ is/are objected to.
8) Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
10) The drawing(s) filed on ____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) Notice of Informal Patent Application (PTO-152)
6) Other: _____

DETAILED ACTION

1. The response received on March 02, 2004 has been placed in the file and was considered by the examiner. An action on the merits follows.

Response to Arguments

2. Applicant's arguments filed on March 02, 2004 have been fully considered. A response to these arguments is provided below.

35 USC 112 Rejections

Summary of Argument: The applicant has cancelled the rejected claim 7 and rewritten the subject matter thereof in new claim 13. The applicant argues that the 35 USC 112, 2nd paragraph rejection has been overcome in view of this amendment (remarks pg. 7 paragraph 2).

Examiner's Response: The applicant has cancelled claim 7, so it follows that the claim 7 rejection is withdrawn. The applicant has rewritten the subject matter in the new claim 13 and cleared up the previous 112 issues. Consequently, the previous claim 7 rejection is not applicable to claim 13 and all of the 35 USC 112, 2nd paragraph rejections are withdrawn.

Prior Art Rejections

35 USC 102(b) Rejections

Applicant's Argument: The applicant argues that the Shiraiwa reference does not teach the limitations of claims 1 and 9. Specifically, the applicant asserts that the "Shiraiwa reference fails to teach contrast estimation means" (remarks pg. 9)

Examiner's Response: Shiraiwa discloses an image-reproduction-parameter-determination section which obtains frequency distribution diagram (e.g. histogram) of luminance levels of an image from the image data (Shiraiwa col. 6 lines 53-56). A histogram of luminance values shows the range of luminance values in an image and the frequencies with which those values occur. As a result, the frequency

Art Unit: 2621

distribution diagram indeed qualifies as an estimate of contrast of the image as recited in the claim. It follows that the image-reproduction-parameter-determination section (which obtains the frequency distribution diagram from image data) and the image pickup data holding section (which provides the image-reproduction-parameter-determination section with the image data) qualify as the contrast estimation means.

Applicant's Argument: The applicant additionally argues the claim 1 and 9 rejections by stating that the Shiraiwa reference does not teach a luminance correction means for raising the contrast of the image on the basis of estimated contrast (remarks pg. 10).

Examiner's Response: Shiraiwa discloses performing luminance-distribution-smoothing processing on the basis of the luminance histogram (which was shown above to be analogous to an 'estimate of contrast' as recited in the claim) (col. 6 lines 56-59) The luminance-distribution-smoothing (or histogram smoothing) operations are well known in the art to enhance contrast (which is analogous to 'raising contrast' as recited in the claim). Consequently the claimed limitation of 'raising the contrast' is inherently disclosed in the teachings of Shiraiwa. United States Patent Application Publication 2002/0174887 to Oh et al. is provided as a reference which will further clarify that contrast raising is inherent in a histogram smoothing operation. Paragraphs [0006] and [0007] clearly show that a "conventional histogram smoothing apparatus" enhances the contrast of an image.

35 USC 103 Rejections

Applicant's Argument: With regard to the 103 rejections of claims 2, 6, 8 and 10 that uses a combination of Shiraiwa and Tokuyama, the applicant argues that "Tokuyama does not teach or suggest the sharpening means for carrying out sharpening for the remaining regions other than the character region in the image at a predetermined sharpening level and for carrying out sharpening for the character

region at a sharpening level higher than the level of sharpening performed for the remaining regions” (remarks pg. 13).

Examiner's Response: Tokuyama discloses carrying out sharpening for the character region at a sharpening level higher than the level of sharpening performed for the remaining regions (Tokuyama col. 11 line 37 – col. 12 line 16 in conjunction with Figure 10). This occurs in the event that the value of XB is between 0 and –25000, the value of XA is between 0 and 50000, and the value of XC is between 0 and 25000. In this situation, the photographic and spot regions (which correspond to XA and XC, respectively) are filtered at one of the predetermined sharpening levels shown in Figures 11(a)-(i) and the character region (which corresponds to XB) is filtered at a sharpening level higher than the other regions.

Applicant's Argument: The remaining arguments are based on the “deficiencies of the Shiraiwa reference”.

Examiner's Response: The applicant's arguments related to the deficiencies of Shiraiwa have been addressed above. Consequently, the further arguments will not be individually addressed.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiraiwa (US Patent 6,201,893).

With respect to claim 1, which is representative of claim 9, Shiraiwa discloses a display means with predetermined gradation characteristics (column 3, line 54 and element 40 of Figure 1). Although predetermined gradation characteristics are not explicitly disclosed in Shiraiwa, it is well known in the art that display devices are inherently associated with predetermined gradation characteristics.

Art Unit: 2621

Shiraiwa also discloses an image input means for inputting an image composed of pixels (column 3, line 52). The color image pickup unit (element 10 of Figure 1) disclosed in Shiraiwa is analogous to an input means as stated in the application.

Shiraiwa also discloses contrast estimation means for estimating the contrast of an image (column 6, lines 53-56). The distribution diagram (histogram) of luminance levels of an image as disclosed in Shiraiwa is analogous to an estimate of contrast of an image as disclosed in the application. It follows that the image-reproduction-parameter-determination section (which obtains the frequency distribution diagram from image data) and the image pickup data holding section (which provides the image-reproduction-parameter-determination section with the image data) qualify as the contrast estimation means.

Shiraiwa also discloses luminance correction means for raising the contrast of the image on the basis of estimated contrast (column 6 lines 56-59) and correcting luminance of the pixels of the image based on gradation characteristics (column 4 lines 20-32 and column 5 lines 52-55). Shiraiwa discloses performing luminance-distribution-smoothing processing on the basis of the luminance histogram (which was shown above to be analogous to an 'estimate of contrast' as recited in the claim) (col. 6 lines 56-59). The luminance-distribution-smoothing (or histogram smoothing) operations are well known in the art to enhance contrast (which is analogous to 'raising contrast' as recited in the claim). Consequently the claimed limitation of 'raising the contrast' is inherently disclosed in the teachings of Shiraiwa.

Said luminance distribution smoothing determines image reproduction parameters for pixel luminance. Said parameters, which are held in the image reproduction parameter determination section (element 32 of Figure 1), are then used by the image reproduction processing section (element 35 of Figure 1) to produce image data. Note also that gradation characteristics are one of the reproduction parameters held in the parameter determination section that the reproduction processing section uses to process image data. As a result, the combination of the parameter determination section and the processing section as disclosed in Shiraiwa is analogous to luminance correction means as stated in the application.

Shiraiwa also discloses that said display means display an image that has been corrected by said luminance correction means (column 4 lines 48-51).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2621

4. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiraiwa in view of Kuo (US Patent 5,982,926). The arguments as to the relevance of Shiraiwa in paragraph 2 are incorporated herein.

With regard to claim 11, which is representative of claim 12, Shiraiwa discloses a contrast estimation means for estimating contrast of an input image and a luminance correction means for raising the contrast of an input image. Shiraiwa does not define the contrast in terms of a luminance corresponding to lines and dots in the image and a luminance corresponding to the background of the image. Shiraiwa also fails to expressly disclose that the contrast of the image is raised to a maximum contrast corresponding to a lower limit of luminance (Vmin) and an upper limit of luminance (Vmax).

Kuo defines the contrast of the input image in terms of luminance components ymin and ybkg ([ymin,ybkg]) (column 9 line 38). Luminance term ymin corresponds to the foreground of a textual image document (column 9, lines 29-30 and column 9, line 11). The foreground of a textual image document as disclosed in Kuo is analogous to lines and dots generated in the input image as stated in the application and luminance term ymin from Kuo is analogous to Lv as stated in the application. Luminance term ybkg corresponds to the background of an image (column 9, lines 19-21) and is analogous to luminance term Hv as stated in the application.

Kuo further discloses enhancing the contrast of the image by mapping the luminance component from [ymin,ybkg] to [YMIN,YMAX], where YMIN and YMAX are, respectively, the minimum and maximum Y values of available luminances (column 9, lines 37-41). The term [YMIN,YMAX] disclosed in Kuo is analogous to [VMIN,VMAX] as stated in the application. The idea of enhancing contrast by mapping luminance components as disclosed in Kuo is analogous to raising the contrast as stated in the application.

It would have been obvious at the time of the invention to modify Shiraiwa's contrast estimation and luminance correction means by defining contrast of an image in terms of two luminance terms and mapping those luminance terms to minimum and maximum levels in order to enhance the contrast of the image. Such a modification would have allowed for a method that effectively removes blurring from an image and maximizes contrast (Kuo column 9, lines 57-58). It also would have allowed for a contrast enhancing method that utilized the full range of luminance values (Kuo column 8, lines 56-57).

5. Claims 2, 6, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiraiwa (US Patent 6,201,893) in view of Tokuyama (US Patent 6,240,206). The arguments as to the relevance of Shiraiwa in paragraph 2 are incorporated herein.

With regard to claim 2, which is representative of claim 10, Shiraiwa discloses a display means having predetermined gradation characteristics, an image input means for inputting an image composed of a plurality of pixels and a luminance correction means that corrects the luminance of pixels constituting an image based on gradation characteristics. Shiraiwa additionally discloses that said display means displays the image in which the luminance of each of the pixels has been corrected by the luminance correction means. Shiraiwa does not disclose a character region extraction means or a sharpening means.

Tokuyama discloses a character region extracting means for extracting character regions from an image (column 2, lines 20-28). The region separating section (element 12, Figure 1) as disclosed in Tokuyama is analogous to a region extracting means as stated in the application.

Tokuyama discloses carrying out sharpening for the character region at a sharpening level higher than the level of sharpening performed for the remaining regions (Tokuyama col. 11 line 37 – col. 12 line 16 in conjunction with Figure 10). This occurs in the event that the value of XB is between 0 and -25000, the value of XA is between 0 and 50000, and the value of XC is between 0 and 25000. In this situation, the photographic and spot regions (which correspond to XA and XC, respectively) are filtered at one of the predetermined sharpening levels shown in Figures 11(a)-(i) and the character region (which corresponds to XB) is filtered at a sharpening level higher than the other regions. The degree of enhancement as disclosed in Shiraiwa is analogous to the level of sharpening recited in the claim.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing system of Shiraiwa to include character region extraction means and sharpening means for sharpening character regions at a higher level than non-character regions as taught by Tokuyama. Such a modification would have allowed for an image processing apparatus capable of improving the quality of an image comprised of character regions and non-character regions.

With regard to claim 6, Shiraiwa discloses contrast correction means for raising the contrast of the image on the basis of estimated contrast (Shiraiwa column 6 lines 53-59). Shiraiwa discloses performing luminance distribution smoothing processing on an image on the basis of its contrast. Luminance distribution smoothing is a method well known in the art for enhancing the contrast of an image. Enhancing the contrast of an image is analogous to raising the contrast of an image or lowering it as needed based on the histogram of luminance levels (column 6 lines 57-58). Said luminance distribution smoothing determines image reproduction parameters for pixel luminance. Said parameters, which are held in the image reproduction parameter determination section (element 32 of Figure 1), are then used by the image reproduction processing section (element 35 of Figure 1) to produce image data. As a result, the combination of the parameter determination section and the processing section as disclosed in Shiraiwa is analogous to contrast correction means as stated in the application.

With regards to claim 8, the combination of Shiraiwa and Tokuyama discloses a system comprised of character region extracting means, sharpening means and luminance correction means. Shiraiwa further discloses performing image reproduction processing on an image where the pixels are represented by three color components (Shiraiwa column 3, lines 65-68 with column 4 lines 1-19). Shiraiwa discloses performing image reproduction processing on digital RGB data, which is analogous to a case where luminance is represented by the sum of predetermined three color components as stated in the application.

Art Unit: 2621

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa and Tokuyama as applied to claims 2, 6, 8 and 10 above, and further in view of Takagi ("Selective Image Sharpening", Image Analysis Handbook. University of Tokyo Press January 17 1991, page 549).

The combination of Shiraiwa and Tokuyama discloses a sharpening means, but fails to disclose the exact formula that the sharpening means uses in order to correct luminance values in both character and non-character regions. Takagi discloses the exact formula utilized by the sharpening means to obtain luminance values as stated in the application.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing system disclosed in the combination of Shiraiwa and Tokuyama by including the selective sharpening method disclosed in Takagi. Such a modification would have allowed for the use of a method well known in the art in order to implement the selective sharpening of character and non-character regions. Said method could be easily implemented because of the ease with which the transition is made between the sharpening of character regions and the sharpening of non-character regions.

7. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa and Tokuyama as applied to claim 2 above, and further in view of Pollard (US Patent 6,266,439) and Katsuyama (US Patent 6,035,061). The arguments as to the relevance of the combination of Shiraiwa and Tokuyama in paragraph 5 are incorporated herein.

With regards to claim 4, Tokuyama further discloses a character region extracting means that extracts a region in which the difference between the maximum value and minimum value of luminance of the plurality of pixels in the respective regions is not less than a reference difference value (column 5 lines 6-28,44-51). A block as disclosed in Tokuyama is analogous to a region containing a plurality of pixels as stated in the application. The (maximum value - minimum value) operation from Tokuyama gives a feature parameter Pa which is then compared to the region separation tables in Figure 13. These tables are analogous to a reference difference value as stated in the application. The combination of Shiraiwa and Tokuyama does not expressly disclose converting the luminance values of pixels into binary form, obtaining blocks of pixels having equal binary-coded luminance or obtaining rectangles circumscribing blocks of connected pixels. Pollard discloses converting the pixels of the image into binary form (column 4 lines 56-62). The process of snapping some pixels to white and snapping other pixels to black as disclosed in Pollard is analogous to converting the pixels into binary form as stated in the application. Pollard also discloses obtaining blocks of connected pixels with the same luminance (column 9, lines 18-22). The contiguous runs disclosed in Pollard are analogous to blocks of connected pixels as stated in the application. The appropriately labeled status pixels disclosed in Pollard are grouped according to luminance classification and are therefore analogous to having the same luminance level as stated in the application. Katsuyama discloses integrating circumscribed rectangles overlapping one another into a single circumscribed rectangle (column 11, lines

Art Unit: 2621

43-48 in conjunction with Figure 15). The unification of rectangles that overlap as disclosed in Katsuyama is analogous to integrating the rectangles as disclosed in the application.

With regards to claim 5, Katsuyama additionally discloses extracting regions in nearly parallel with a predetermined axis line as character regions (column 28 lines 49-58). The table ruled lines as disclosed in Katsuyama are analogous to predetermined reference axis lines that arrange regions in parallel as stated in the application.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the combination of Shiraiwa and Tokuyama by including the binary conversion of pixel values and the grouping together of pixels with the same luminance as taught by Pollard and the integration of circumscribed rectangles and the arrangement of character regions in parallel with a reference axis line as taught by Katsuyama. Such a modification would have allowed for a system of efficiently extracting characters from character regions in an image.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa and Tokuyama as applied to claim 6 above, and further in view of Yamazaki (US Patent 5,801,791). The arguments as to the relevance of the combination of Shiraiwa and Tokuyama as applied in paragraph 5 are incorporated herein. The combination of Shiraiwa and Tokuyama discloses contrast estimation means that generate a histogram of pixel luminance for an image. It does not disclose estimating contrast by splitting the histogram into two ranges and comparing maximum luminance values of the ranges to predetermined reference values. Yamazaki discloses splitting a histogram into two ranges based on the average brightness of the input data (column 2 lines 46-51). Yamazaki further discloses using a maximum value and a minimum value from the ranges in order to estimate contrast (column 2 lines 18-31,51-54).

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the combination of Shiraiwa and Tokuyama by including contrast estimation means that split a luminance histogram into two ranges and find maximum and minimum values from those ranges. Such a modification would have allowed for a way to display the character regions of an image with a clear outline. (Yamazaki column 1 lines 53-54).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ogata (USPN 5,848,181).

Nakajima (USPN 5,028,782).

Kanno et al. (USPN 5,687,252).

Art Unit: 2621

Lin et al. (USPN 5,742,703)

Lin et al. (EP 0 768 792 A2)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick L Edwards whose telephone number is (703) 305-6301. The examiner can normally be reached on 8:30am - 5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on (703) 305-4706. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Patrick Lynn Edwards

Art Unit 2621

ple



LEO BOUDREAU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600